

What's Cropping Up?

A NEWSLETTER FOR NEW YORK FIELD CROPS & SOILS

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With the spring planting season just around the corner, many farmers and agribusiness professionals are beginning to think about the options for controlling corn rootworm (CRW) in New York continuous corn fields. When making the decisions about which fields to actively manage the potential for corn rootworm injury, it is helpful to remember that fields planted for corn silage production will benefit more from the active management of corn rootworm than fields planted for grain production. Moderate levels of rootworm injury may result in measurable silage losses whereas the same level of injury may not show up in grain yield reduction. The relationship between root injury from rootworm feeding and yield losses is very dependent on rainfall timing and rainfall amounts during the root regeneration phase after root feeding has stopped. (late July-early August).

Controlling CRW with Crop Rotation:

Since corn rootworm lays its eggs in existing corn fields during August and September, fields at high risk from rootworm injury can be rotated to a non-host crop preventing the use of a corn rootworm insecticide. Any crop which is not corn is a non-host to corn rootworm and will successfully break the life cycle. Since the risk of rootworm injury increases the longer a field is planted to corn, a good crop rotation on a farm reduces the cost of controlling this insect pest. In fact, an annual rotation of corn with a non-host completely eliminates any potential problem from corn rootworm. Monitoring data collected in New York during the past 10 years indicates that only 25-35% of 2nd year corn fields have a high potential of a damaging rootworm population while 50-70% of 3rd year fields and 80-100% of 4th year and older fields have a high potential of economic rootworm populations. Agronomists have also demonstrated additional rotation benefits such as improved soil tilth and increased yields. Serious consideration about rotation should be given to any corn field which has been planted to 3 or more years of continuous corn.

Corn Rootworm Management Options for 2001

**Elson Shields,
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Controlling CRW with Soil Insecticides:

Soil insecticides continue to provide excellent control of corn rootworm in NY fields. Excellent and consistent performance of Counter 20CR, Force 3G and Lorsban 15 G (soil PH < 7.5) when used in T-Band was once again recorded in Cornell University research trials conducted in 2000. However, these same insecticides gave variable performance in the 2000 trials when placed In-Furrow. These results are consistent with research results conducted at Cornell for the past 14 years. In wet years, Force and Lorsban (soil PH < 7.5) perform slightly better while Counter performs slightly better in dry years. In soils with PH > 7.5, Lorsban is not recommended because poor control is often observed. However to have soil insecticides be completely effective, the insecticide applicators on the planter need to be calibrated before the planting season begins and the calibration needs to be rechecked several times during planting. With the current low corn prices, many growers are considering using reduced rates of soil insecticide to save costs. In most years using a T-Band application, rates can be reduced to 75% of the full label rate without a decrease in performance. Performance starts becoming consistently variable when rates are reduced to 66% or lower. As rates of active ingredients are reduced, careful calibration of the granular applicators become increasingly important. The physical limitation of our granular applicators is 3-4 oz per 1000 linear ft. so the feasibility of rate reduction varies with the product. For example, Force with a full label rate of 4 oz/1000

linear ft. of row cannot reliably be reduced in rate due to the physical limitation of the granular applicators. In contrast, Counter 20 CR with a full label rate of 6 oz/1000 linear ft could be reduced to the 75% rate. Please keep in mind that rate reduction reduces or eliminates the safety margin for these materials and under severe weather conditions or pest pressure, the full label rate may not give completely desirable control.

Controlling CRW with Seed Treatment:

Controlling CRW infestations with insecticide coated on the seed is a new and exciting technology just being introduced into the market place and this new technology will be a focus by the pesticide industry for the next few years. ProShield (Force ST) was first introduced for the 2000 growing season. However, this insecticide using the seed delivery system has not provided the reliable high level of protection that Force in a granular formulation has provided. A new product, Prescribe by Gustafson has been introduced for the 2001 growing season. In university trials around the US and NY, this insecticide delivered on the seed gives adequate control of light to moderate levels of corn rootworm. However, heavy pressure will over run the insecticide and cause damage. A third insecticide being developed by Bayer has shown a higher level of efficacy than the currently marketed materials using the seed coat as a delivery system. In future years, this delivery system will become much more exciting.

Corn Rootworm Resistant Corn Varieties:

If EPA labeling is approved, Monsanto has announced the introduction of rootworm resistant corn for the 2002 growing season. Limited seed availability for 2002 will limit the introduction of this new technology to demonstration trials throughout the Northeast. A greater quantity of seed is expected to become available in the following years. Other seed companies are also developing rootworm resistant varieties for introduction into the market place in the next few years.

Pest Management

Alfalfa - Early Season Crop and Pest Management Opportunities

J. Keith Waldron

Cornell - New York State IPM Program Livestock and Field Crops

Alfalfa's first harvest is typically the largest of the season and provides insight into what might be expected from this year's annual production. Can anything be done *now* to help set the stage for success this summer? Absolutely! An integrated management approach is our best strategy for achieving optimal field productivity and net profitability. An early season field visit might just be the ticket to confirm a healthy stand *and* provide information to head off potential yield robbing crop and pest problems. This article will highlight several management activities to help optimize this years alfalfa production.

Field Visit? - Be Prepared

Prior to the field visit, look over last years crop records. Were there any particular challenges or opportunities? What were last year's yields, fertilizer, manure and lime inputs? What insect, weed, disease, or "other" problems occurred? What management decisions worked well? What could be improved? Check the Cornell Guide for Integrated Field Crop Management and other resources for new information or techniques that could help improve production practices.

Field Reconnaissance

How much alfalfa is actually in your fields? Do your needs and expectations meet the stands "reality"? To evaluate stands, count the number of alfalfa plants (i.e. crowns) per square foot in at least 5 or more areas of the field. Do not select the best or the worst areas to sample but rather sample areas that are representative of the overall field condition. A 1 or 2 square foot frame or similar device can serve as a

template and help speed the sampling process. Be sure to count the actual number of alfalfa crowns and not the number of stems. Numerous vigorous stems per crown are preferred over a few sickly looking stems per crown. Use the information in Table 1 as a guide to help evaluate relative field productivity. This evaluation may suggest it is time to consider other management changes or if conditions are really severe even plow down a thin stand. Evaluate mixed alfalfa stands for grass species and their contribution to overall yield and feed potential.

Healthy Stand?

Field observations should note presence and location of empty open areas, differences in plant height or color, presence and types of weeds, insect injury, disease symptoms, and other potential yield limiting factors. Field visits may call for some detective work. Correct identification is the cornerstone of sound crop and pest management and is needed to identify effective strategies that can help minimize pest impacts and protect productivity. Some common early season activities and pest problems are shown in Table 2. If alfalfa is sparse, stunted or is of questionable health dig up some representative plants. Compare these plants to plants obtained from "healthy" areas in the field. Do root systems appear healthy? Are insect feeding scars present on the root exterior? Use a

knife to slice through the crown and the taproot. Are the internal tissues a healthy white color? Some interior discoloration of root systems can be expected in older stands. Crown rot is indicated by a general "V" shaped discoloration extending from the top of the crown to it's interior. Root rots or vascular wilts are indicated by discoloration within the tap root. If significant portions of the field are affected consider all management options including, if necessary, crop rotation. Disease symptoms can be very subtle, mimicing nutritional deficiencies or other problems. Professional diagnosis may be necessary to identify the actual cause. Long term disease management is largely limited to cultural practices and selection of disease resistant cultivars.

Weeds are opportunists and their encroachment into open areas in the field may be related to other factors such as harvest management, soil drainage, fertility or pH, compaction, diseases or insect damage. Some detective work will be needed to properly identify the real cause of the field problem. In northeastern NY counties from Cayuga and Oswego to Clinton and Essex counties, alfalfa fields with extensive empty or dead areas may indicate presence of alfalfa snout beetle. If snout beetles are present, taproots of affected alfalfa will have substantial external scarring, large white larvae may be present, and large numbers of mature, grayish, about 1/2 inch long, snout beetles may be observed in and leaving fields in April.

Alfalfa Weevil Watch

The relatively mild winter and an early alfalfa "green-up"

Table 1: Suggested number of alfalfa crowns per square foot in a field with good production potential.

Harvest Year	"Suggested" Alfalfa Crowns Per Square Foot
New Seeding	12 – 20
1 st Year Stand	6 – 12
2 nd Year Stand	5 – 8
3 rd Year Stand	4 - 6

Pest Management

could favor potential alfalfa weevil (AW) problems this year. Early season crop monitoring for AW is recommended in established stands. AW overwinter as adults in hedgerows and areas outside the alfalfa field. In early spring, mid to late April, the 1/4 inch brown weevils enter the field and females begin laying eggs in the base of alfalfa stems. Fields on south facing slopes may be the first to show signs of weevil feeding. Careful observation can detect small holes, about 1/16 inch in diameter, bored into the young succulent alfalfa stems about 2 – 3 inches above the crown. Depending on temperature, eggs hatch in 7 to 10 days. Weevil larvae crawl out of the stem and up the plant stem eventually eating their way into young alfalfa buds. As larvae feed they increase in size from about 1/8 inch to 3/8 inch. Weevil larvae have a characteristic dark brown to black head capsule and a thin white stripe that extends along the top of their backs. Larvae grow quickly under warm conditions. Weevil foliar damage initially appears as a “shot hole” and may continue to completely skeletonize the young leaves. As larvae grow, they consume more with the last growth

stage consuming nearly 80% of the total foliage eaten by *all* stages. High weevil populations can lead to dramatic changes in field condition in a short period of time. In severe circumstances, large weevil populations can strip alfalfa foliage leaving only the silvery-white “veins” of former leaves. Yield losses of 25% are not uncommon. For this reason, weekly field monitoring is recommended.

To monitor for weevil, walk through the field and collect 25 – 50 stems at random in various locations in the field interior. Be careful not to select stems that appear particularly “good” or “damaged”. Record the number of stems that have foliar feeding injury. If one or more leaves per stem show feeding injury they are considered positive. Weevil management prior to first harvest is warranted when 40% of stems collected are positive for AW foliar damage.

If AW populations are above the action threshold consider an early harvest if within one week of regular harvest. This practice is effective and will help conserve the weevil’s natural enemies.

If early harvest is not possible, consider using an appropriately labeled insecticide to avoid significant losses.

Alfalfa weevil have only one generation per year in NY. Fortunately their presence coincides roughly with the timing of our first harvest. AW monitoring should continue following first harvest through early regrowth. Pay close attention to fields, particularly windrow areas, if cold or dry weather conditions persist and regrowth is delayed. Action thresholds for AW after first cutting are 50% of stems showing signs of weevil feeding.

This article has highlighted some timely early season alfalfa monitoring opportunities to confirm crop condition and head off potential pest and production problems which could reduce yields. Additional information can be found in sources like the Cornell Guide for Integrated Crop Management and Your Pocket Guide for Field Corn and Alfalfa Management. For more information contact your local CCE Field Crops Educator.

Good Luck this Season!

Table 2: Early season alfalfa management opportunities and potential problems.

ALFALFA: EARLY SEASON (Late April – early June)		
Stand Assessment Activities – evaluate fields for....		
<i>Crop Condition?</i>	<i>Crop Growth?</i>	<i>Winter Kill?</i>
<i>Frost Heaving?</i>	<i>Nutrient & pH Deficiencies?</i>	<i>Replant Decisions?</i>
<i>Crown Counts?</i>	<i>Pest Monitoring?</i>	<i>Other Problems?</i>
Pest Monitoring – check for common early season insect, disease and weed pests...		
<i>Seedling Diseases?</i>	<i>Weeds?</i>	<i>Sclerotinia? (Fall seed)</i>
<i>Crown Rot?</i>	<i>Alfalfa Weevil?</i>	<i>Alfalfa Snout Beetle?</i>
<i>Phytophthora Root Rot</i>	<i>Verticillium Wilt?</i>	<i>Foliar Diseases</i>
<i>Other Problems?</i>		

Nutrient Management

Frost Injection of Manure at Table Rock Farm: A Case Study

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Each spring, on farms all over the Northeast, the race is on to accomplish a large amount of field work in a very limited amount of time. Manure needs to be spread, crops need to be planted, and, before you know it, hay is ready to be harvested. Western New York's unpredictable spring weather can further reduce the window of opportunity for optimal timing. Frost manure injection is one procedure that Table Rock Farm has implemented to redistribute the spring workload while maintaining good environmental stewardship.

Table Rock Farm is a dairy operation located in Wyoming County, New York. The farm has 850 lactating cows, 115 dry cows, and 636 heifers and calves for a total of 1719 animal units. The farm produces approximately 10,300,000 gallons of waste and 1600 tons of manure. There is a total of 1200 acres of cropland. Table Rock Farm has two 5000-gallon tractor-drawn tankers with injectors (Fig. 1). Additionally, there are four truck spreaders with 4500-gallon tanks to transport the waste to the field spreaders.

One of the reasons that the farm purchased injectors is to increase the amount of the manure's nitrogen available for the crops. Six years ago a 15 row, 15-inch corn planter was purchased. This has increased corn production and eliminated the ability to side dress nitrogen. The last three years' corn silage yield has averaged 24 tons per acre at 30% DM. At this average yield, one hundred eighty pounds of nitrogen is needed to meet the crop requirements. Based on the average spring manure sample, the total nitrogen is 24 pounds per 1000 gallons, 12 pounds organic N and 12 pounds of ammonia. Spring injection



Fig. 1: Frost injection of manure at Table Rock Farms (photo by E. Jacobs)

increases the value of nitrogen two fold. If 8000 gallons of manure is surface applied and not worked in within three days, approximately 48 pounds will be available to the crop (50 percent of the organic nitrogen). If spring injected, approximately 110 pounds will be available. Other positives associated with injection are limiting the risk of nutrient runoff and reducing odor. Good environmental stewardship is not only a governmental requirement, but one of the farm's primary missions. Converting to injection reduced odor problems, and neighbor complaints have been eliminated.

The challenge on this farm, as well as many other dairy farms, is to accomplish the large spring workload in a timely manner, within the guidelines of a Comprehensive Nutrient Management Plan. Each spring, approximately five million gallons of manure need to be hauled to the fields and spread, and 200

acres of alfalfa seedings and 650 acres of corn need to be planted. Timeliness is critical. To make a profit, the clearly defined goals of the farm's staff is to have the seedings planted by April 20th, corn planted by May 10th and first cutting harvested by the end of May, while dealing with the unpredictability of Western New York weather. To accomplish the goal of harvesting the new seedings three times, early planting is a must and, according to Cornell research, corn that is planted by the end of April or early May has a 10 percent yield advantage over corn planted in mid May (May 25 is 20 percent).

In good weather, it takes Table Rock Farm 20 days to haul out and apply 5,000,000 gallons of manure, 5 days to till, fit and drill the seeding, and 10 days to plant the corn. Weather, breakdowns, and labor problems can certainly throw a monkey wrench into the best laid plans. If one task is delayed, a domino effect can alter the timeliness needed for planting or harvesting.

Frost Tillage

Frost tillage can be performed when the upper surface is frozen and the subsurface is still unfrozen (see also *What's Cropping Up* Vol 6, No4, and Vol 3, No 1). Northeast tillage is seldom done in winter or early spring because soil is either saturated or frozen. However, during a freeze cycle in late winter or early spring, the soil will have a few days when the frost is shallow (4 inches or less) which provides the opportunity for frost tillage and manure injection.

Redistribution of the moisture in the soil creates the conditions for frost tillage. When frost sets into unfrozen

soil, the subsoil water is drawn up into the frozen surface layer, leaving the subsurface dry enough to till, at least as long as the frost depth is less than 4 inches. Using the reliable climatic data from the U.S. National Weather Service network of volunteer observers a model was developed to estimate frost penetration depth. Based on this analysis, Table Rock Farm has an average of 4 days per year with conditions that allow for frost tillage (Fig. 2). In general, after an initial thaw, soil that experiences two to three days of good freezing temperatures (daily minimum temperatures below 15 degrees F and maximum temperatures below freezing) would produce conditions favorable for frost tillage that may persist for a few days. If snow coverage follows immediately, the window may extend for several more days.

Before applying frost tillage, a "ball test" is recommended by digging through the frozen layer with a shovel and attempting to squeeze a sample of the unfrozen soil into a ball. If the soil molds and forms a ball, it is too wet to till. If the soil crumbles the conditions are favorable for frost tillage.

Frost Manure Injection on Farm

Based on our frost tillage research, the concept emerged to use injectors to simultaneously till the soil and inject manure into the frozen soil profile, which was presented to the Table Rock

Farm staff. They were receptive to the idea, and in the late winter of 1999 approximately 1,000,000 gallons of manure were injected into the soil. In early March the following year, approximately 1,500,000 gallons were injected into about 150 acres of land. Five days worth of manure spreading was done in 2000 prior to the spring thaw. With the high precipitation of spring and summer 2000, this helped ease the burden by spreading the workload out and allowing the farm to stay within its time schedule. The staff observed that a rye cover crop, planted originally for soil conservation, seemed to help promote a shallower frozen subsurface allowing a much wider time window for frost injection.

In addition to easing the spring workload, frost injection also reduced soil compaction. A 220 horse power tractor pulling a tanker load of manure combines to weigh 40 tons. Especially in the spring, serious compaction damage may occur with this much weight. Using frost injection, the frozen zone supports the equipment with no compaction damage to the soil. Despite the advantages, there are also drawbacks to the system. It takes approxi-

mately 20 percent more power to inject into frozen soil than normal soil conditions. The wear and tear on equipment will increase as well, and, fields that vary in topography make injection difficult. Some areas will have favorable conditions while other areas within the same field will not. Knolls are more likely to have a deeper frost zone than valleys and have caused damage to the injectors when the frozen depth was too deep.

Conclusion

Frost injection or incorporation provides an environmentally safe means for farmers to shift some workload from the spring to the winter. Fields that could possibly be a concern for runoff with normal winter spreading, can safely be spread using this best management practice. Emerging EPA and NRCS guidelines may disallow winter spreading on frozen ground with the potential for waste runoff. In some states, like Vermont, a law has been passed that prohibits all winter spreading on frozen ground. Laws and standards should give special consideration for frost manure injection/incorporation as an environmentally sound practice.

Acknowledgement: The authors recognize Table Rock Farm staff members Jeff Jordan and Richard Sanford for their contributions in making frost manure injection a successful practice on the farm.

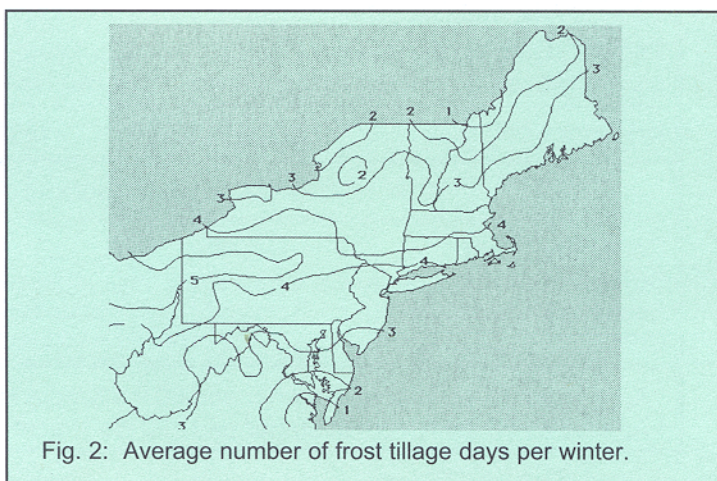


Fig. 2: Average number of frost tillage days per winter.

Nutrient Management

How Much N Fertilizer on Corn Following Soybeans or Wheat/Clover?

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Nitrogen fertilizer prices have increased dramatically during the past year. Meanwhile, corn grain prices have remained very low. As a result, over-applying N fertilizer could have severe economic consequences. Now would be a good time to carefully analyze N fertilizer practices on corn follow-

100 lbs N/acre or 150 lbs N/acre, the Cornell recommended rate for continuous corn. Adding the additional 50 lbs of N did not increase corn yields on these fields. The average yields were low because of the very dry conditions in 1999 so the lack of a response to an application above 100 lbs/acre was

(*What's Cropping Up?* Vol. 9, No. 3, p. 4-5).

The 2000 growing season was wet, and yields were high in fields that had drainage and were planted early. Nevertheless, a study at the Aurora Research Farm, indicated that optimum corn yields were obtained at a sidedress N rate of 100 lbs/acre independent of the previous soybean yield (Fig. 1). Despite the wet conditions and high corn yields, corn required only a total of 125 lbs N/acre to maximize yields (25 lbs N/acre as a starter plus 100 lbs/acre sidedressed). Based on these results, we recommend an application of about 85 to 100 lbs/acre under dry spring conditions and 100 to 125 lbs/acre of fertilizer N under wet spring conditions when corn follows soybeans.

Table 1. Corn yields following soybeans at two N rates on three farmers' fields in Seneca County in 1999.

N RATE	FIELD I	FIELD II	FIELD III	MEAN
lbs/acre	-----bu/acre-----			
50 [†] + 50 [‡]	98	103	63	88
50 + 100	98	101	59	86

[†] Applied at planting.

[‡] Applied at sidedressing.

ing annual legumes such as soybeans, dry beans, and peas or following green manure crops such as red clover interseeded into wheat. This article will discuss N fertilization of corn following soybeans or wheat/clover, which represents about 33% of the grain corn acreage in New York.

We evaluated corn yields following soybeans under two N rates in a precision agriculture study on three farmers' fields in 1999 (Table 1). Application rates were

expected. Similar results were obtained in 1993, 1995 and 1997 which were all dry years as well

We compared optimum N rates for corn following soybean, corn following soybean-wheat/clover,

Table 2. Corn yields, averaged across the 1993 through 1997 growing seasons, in three crop rotations under two N rates.

ROTATION	85 lbs N/acre [†]	145 lbs N/acre [‡]
	-----bu/acre-----	
Continuous Corn	85	124
Soybean-Corn	129	144
Soybean-Wheat/Clover-Corn	139	147

[†] Applied as 25 lbs N/acre in starter and 60 lbs N/acre sidedressed.

[‡] Applied as 25 lbs N/acre in starter and 120 lbs N/acre sidedressed.

and continuous corn using two inorganic N levels (85 vs. 145 lbs N/acre) in field trials conducted from 1993 through 1997 at the Aurora Research Farm (Table 2). The results for corn following soybean were previously reported (*What's Cropping Up?* Vol. 9, No. 3, p. 4-5). When corn followed wheat/clover, corn yielded only 8 bu/acre less at 85 vs. 145 lbs/acre. A significant response was observed in the wetter years only. In the dry years of 1993, 1995, and 1997, corn following wheat/clover

yielded the same at 85 and 145 lbs N/acre (data not shown). Corn following wheat/clover vs. soybean yielded 10 bu/acre more at the 85 lb/acre N rate and 4 bu/acre more at the 145 lb N/acre rate, indicating the addition of a wheat/clover crop will allow for a reduction in N application without yield decline. Thus, if the red clover interseeded into wheat establishes well and has significant fall growth, we recommend 60 to 85 lbs/acre under dry spring conditions and up to 100 lbs/acre of fertilizer N under wet

spring conditions on corn following wheat/clover.

Our results indicate that New York corn growers, who plant corn following soybeans or wheat/clover, can achieve optimum yields at significantly reduced N fertilization rates. The use of the pre-sidedress nitrogen test (PSNT) may provide growers with additional guidance on how much N to apply, especially if spring conditions are excessively wet or dry.

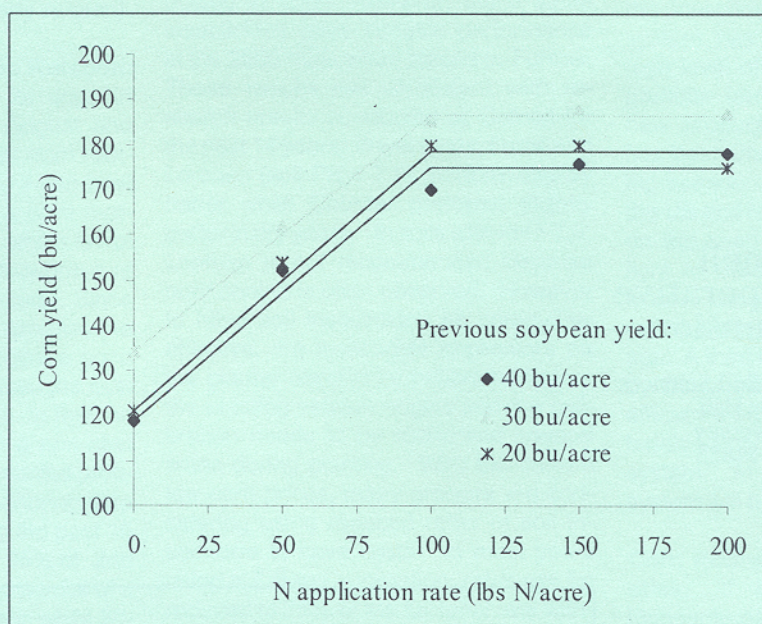


Figure 1: Corn yields following soybeans with different yields in the previous year at the Aurora Research Farm in 2000. All treatments received 25 lbs N/acre in a starter fertilizer.

Calendar of Events

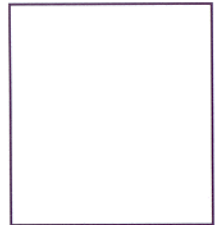
June 7	Small Grain Management Field Day, Musgrave Research Farm, Aurora, NY
June 24-27	Northeastern Branch ASA-SSSA Annual Meeting, University of Rhode Island, Kingston, RI
July 6	Weed Science Field Day, Valatie Research Farm, Valatie, NY
July 13	Aurora Field Day, Musgrave Research Farm, Aurora, NY
July 17	Weed Science Field Day, Musgrave Research Farm, Aurora, NY
July 18	Weed Science Field Day, Thompson Research Farm, Freeville, NY
Oct. 21-25	ASA-CSSA-SSSA Annual Meetings, Charlotte, NC
Oct. 30	Field Crop Dealer Meeting, Chaucers Restaurant, Clifton Park, NY
Oct. 31	Field Crop Dealer Meeting, Ramada Inn, New Hartford, NY
Nov. 1	Field Crop Dealer Meeting, Batavia Party House, Batavia, NY
Nov. 2	Field Crop Dealer Meeting, Holiday Inn, Auburn, NY

What's Cropping Up? is a bimonthly newsletter distributed by the Crop and Soil Sciences Department at Cornell University. The purpose of the newsletter is to provide timely information on field crop production and environmental issues as it relates to New York agriculture. Articles are regularly contributed by the following Departments at Cornell University: Crop and Soil Sciences, Plant Breeding, Plant Pathology, and Entomology. **To get on the mailing list, send your name and address to Pam Kline, 144 Emerson Hall, Cornell University, Ithaca, NY 14853.**



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